ES 155 MARCH, 1987

Manitoba Health and
Manitoba Environment and Workplace Safety and Health

Public Water Systems - Chlorine Residual Testing and Reporting and Bacteriological Water Sampling, Submission and Interpretation

The regulatory reference for this document is Section 59, Division VII of revised Regulation P210-R3 under the Public Health Act.

A. Chlorine Residual Testing and Reporting

1. General

Subsection 59(4) of the Regulation requires that a free chlorine residual of not less than 0.5 mg/L be maintained in the treated water within the water supply plant prior to distribution, unless approved by the Minister.

Subsection 59(2) requires daily testing for chlorine residuals in the water plant.

Subsection 59(1) of the Regulation requires that a measurable free chlorine residual be maintained at all times throughout the public water system.

Subsection 59(3) requires testing for chlorine residuals at reasonable intervals from representative points in the system.

2. Testing Procedures

The DPD Method, as outlined in the 16th Edition of "Standard Methods for the Examination of Water and Wastewater", is considered to be an acceptable method for the chlorine residual testing required under Section 59 of the Regulation. The district Public Health Inspector or the Medical Officer of Health should be consulted if the use of a different method is contemplated for chlorine residual testing.

3. Recording and Submission of Data

Daily test results for free and total chlorine residuals shall be recorded on the "Monthly Water Chlorination Report" form (ES 137) provided by Manitoba Environment and Workplace Safety and Health. Plant information, residuals, daily water consumption and comments should be entered on the form in the appropriate locations. A sample of this form is attached for your information as Appendix A.

The form provides three copies of the monthly record. At the end of every month, the copies of the form should be distributed as follows:

Part 1 - to be sent to the district Public Health Inspector;

Part 2 - to be retained in the water treatment plant; and

Part 3 - to be submitted to Environmental Control Services in Winnipeg via the postage-paid, self-addressed envelope provided.

Subsection 59(6) of the Regulation requires that the water supplier maintain the chlorine residual test records for a period of not less than 24 months.

B. Bacteriological Water Sampling Submission and Interpretation

1. General

The objective of bacteriological testing for the routine examination of most potable water supplies, particularly those that are disinfected, is to determine compliance with accepted water quality standards. It is also used as a measure of either the efficiency of treatment plant operation or the possibility of bacterial contamination.

Subsection 59(7) of the Regulation specifies that the water supplier ensure that water samples are taken and submitted for analysis in accordance with established procedures. The responsibility for the efficient and safe operation of the water plant and the supply of a microbiologically safe drinking water rests with the supplier of water.

2. Frequency and Schedule of Sampling

On a routine basis, samples for bacteriological analysis shall be collected and submitted according to the schedule as set out in Appendix B. In addition to the treated water samples, a sample of raw water shall also be submitted. Deviation from this procedure must be approved by the district Public Health Inspector or the Medical Officer of Health.

It is recommended that the samples be collected early in the week to provide adequate time for transport and analytical setup. Bacteriological samples must be analyzed as soon as possible and preferably within 24 hours of collection. The results of samples analyzed more than 48 hours after collection are not reliable and are reported accordingly.

In order to minimize transport time, it is recommended that bus express, air express, courier delivery or personal delivery be used. The use of regular mail service is not recommended unless absolutely necessary. Coordination of sampling day and time with the transport schedule will minimize the standing time of samples and maximize the reliability and accuracy of results.

Depending on the season and the time of transport, bacteriological samples should be kept cool or insulated to preserve freshness and prevent freezing.

3. Designation and Identification of Samples

i) The following codes may be used:

MW - Municipal supply from one or more municipal wells not connected with a pressure system.

MP - Municipal supply from well(s) or a surface source connected with or in a pressure distribution system, NOT CHLORINATED.

MPC - Municipal supply from underground or surface source connected with or in a pressure distribution system, AND CHLORINATED.

ii) Routine sampling points may be designated by a numbering system plus the applicable code letters. The sample indicated as number 1 is to be raw water prior to any treatment or conditioning.

Example: Town of Anywhere

An - 1 - MP - Treatment Plant - Raw
An - 2 - MPC - Treatment Plant - Wash basin tap.
An - 3 - MPC - Municipal Office - Wash basin tap.
An - 4 - MPC - Anywhere Collegiate - Boys' washroom tap.

If location codes are used, the district Public Health Inspector should be provided with the list of the sites being sampled. If codes are not used, a complete description of the sample locations should be given on the submission form for each sampling.

One of the treated water samples shall be taken at the treatment plant after the required contact time. The remainder of the treated water samples shall be taken from representative points in the distribution system. The district Public Health Inspector or the the Medical Officer of Health may designate the sampling stations to be used.

4. Sample Collection and Submission

A large multi-sheet form (MG6665) should be used for the submission and subsequent reporting of the results of the bacteriological examination of samples of water submitted to either of the two laboratories operated by the Manitoba Government. A sample form is attached for your information as Appendix C.

Sample bottles are available from and samples should be shipped to either:

Cadham Provincial Laboratory
750 William Avenue
Winnipeg, Manitoba
R3C 3Y1
Telephone: 944-0270

or

Westman Laboratory
Brandon Mental Health Centre
1st Street N.
Brandon, Manitoba
R7A 5Z5
Telephone: 728-7110

The following procedure should be used for the taking of bacteriological samples:

i) Only use sample bottles provided by one of the two laboratories designated above.

ii) Keep the sample bottle closed until the sample is to be taken.

iii) Remove the paper hood and cap as a unit; do not touch the inner surface of the cap or the inner neck of the bottle.

iv) Do not rinse the sample bottle as it contains a preservative.

v) Fill the sample bottle to the shoulder (glass bottle) or the line (plastic bottle) with the water to be sampled.

vi) Replace the cap and paper hood immediately and secure back around the top of the bottle.

vii) Identify the sample on the paper hood and on the submission form.

viii) When taking a sample, allow taps to run for several minutes, do not sample from hoses, remove aerators from faucets and collect the sample directly from the source (ie. do not use another container).

5. <u>Interpretation of Total Coliform Results</u>

The membrane filter technique is normally employed for total coliform analysis of drinking water samples. The following are the maximum contaminant levels allowed for treated water:

(a) when 10 or more samples are examined per four week period:

i) at least 90% of the samples shall be negative for total coliform organisms; and

ii) none of the positive results for total coliform organism samples shall have a density greater than 10 total coliforms per 100 millilitres of sample.

(b) when less than 10 samples are examined per four week period:

i) no more than one sample shall be positive for total coliform organisms; and

ii) none of the positive results for total coliform organism samples shall have a density greater than 10 total coliforms per 100 millilitres of sample.

(c) When samples are examined for fecal coliform organisms, none of the results shall be positive.

Notes: i) Under the membrane filter method, "negative" results are normally reported as "<1" (less than 1).

ii) If a result is reported as "overgrown with other organisms", a coliform evaluation of the sample has not been possible. If raw water samples consistently test "overgrown", the multiple tube fermentation technique (M.P.N. Method) should be requested for the raw samples only. "Overgrown" treated water results are considered to be unacceptable and repeat samples shall be taken as soon as possible (see item #6).

6. Positive Coliform Results - Repeat Samples

When the analysis of a sample of treated water collected from a sampling location indicates a potential bacteriological concern, a repeat sample shall be taken. Repeat samples shall be collected from a sampling location when the laboratory result reports that:

i) the total coliform result is "positive" (density of total coliform organisms is 1 or greater); or

ii) the total coliform result is "overgrown with other organisms".

Repeat samples of the treated water at such locations for the purpose of total and fecal coliform analysis shall be taken immediately. For water supplies which are sampled at such a frequency that the repeat samples would coincide with the regular sampling schedule, repeat samples may not be required unless continued positive results occur.

The location at which the repeat samples are taken must not be eliminated from future sampling without the approval of the district Public Health Inspector or the Medical Officer of Health. Repeat samples shall not be included in calculating the total number of samples taken to determine compliance with the sampling frequency.

7. Interpretation of Standard Plate Count Results

The standard plate count (SPC) analysis is advocated as a method for quality control measurement in water treatment plants and as an index of potential water quality deterioration in distribution lines and reservoirs. The reporting range for the SPC analysis is from <10/mL to >3000/mL.

As an interpretative guideline:

i) The SPC analysis provides an index of the level of the general bacterial population in a water sample and is, therefore, a good indicator of the general sanitary quality of the water.

ii) Coliform analytical results may not be reliable for water samples with an SPC greater than 500/mL.

iii) An SPC level of 500/mL should be considered as an objective for finished water, but it is not a set water quality standard. Operators should be encouraged to meet this objective.

iv) Sudden increases in normally low SPC values should be noted as a possible "early warning" sign of potential microbiological problems in the water system. Corrective action such as increasing chlorine residual, examining treatment processes, such as filtration, and watermain flushing and/or swabbing may be considered in reacting to significant increases in the SPC level or an SPC level in excess of the objective.

A significant increase in the SPC level at a particular distribution sampling point indicates a deterioration in microbiological quality in that portion of the system. Similarly, a significant SPC increase on treated water discharged from the water treatment plant suggests that a process deterioration has occurred. This does not necessarily mean the presence of coliform indicators or pathogens, but it does indicate that there is a potential for such microbiological contamination.

Consider the SPC as another diagnostic tool to help you anticipate and correct potential water supply problems.

APPENDIX "A"

Monthly Water Chlorination Report

Manitoba
Environment and
Workplace Safety
and Health
ENVIRONMENTAL CONTROL

PLANT _____ OPERATOR _____

MONTH _____ 19____

SAMPLING LOCATION _____

DAILY CONSUMPTION UNITS: (circle choice) Imperial Gallons U.S. Gallons Cubic Metres

FLOW METERED FOR DAILY CONSUMPTION: (circle choice) Raw Treated No Metering

DATE & TIME	CHLORINE RESIDUAL mg/ℓ		DAILY CONSUMPTION
	FREE	TOTAL	

DATE & TIME	CHLORINE RESIDUAL mg/ℓ		DAILY CONSUMPTION
	FREE	TOTAL	

Comments: (Problems etc.)

_____

_____

_____

_____

_____

DISTRIBUTION

PART 1 – FORWARD TO PUBLIC HEALTH INSPECTOR IN YOUR AREA

PART 2 – RETAIN FOR YOUR RECORDS

PART 3 – RETURN TO "ENVIRONMENTAL CONTROL SERVICES" USING THE POSTAGE PAID, SELF ADDRESSED ENVELOPE PROVIDED

Appendix "B"

Number and Frequency of Bacteriological Sample Submission

System	Number and Frequency of Treated Samples
Standpipe service only; no pressure distribution.	2 taken bi-weekly.
Pressure distribution up to 5000 population.	3 taken bi-weekly.
Pressure distribution from 5001 to 10,000 population.	4 plus 1 per 1000 population in excess of 5000, taken bi-weekly.
Pressure distribution from 10,001 to 50,000 population.	4 plus 1 per 5000 population in excess of 10,000, taken weekly.
Pressure distribution from 50,001 population and up.	11 plus 1 per 10,000 population in excess of 50,000, taken weekly.

Notes: i) The above sample numbers refer to samples of treated water. A sample of raw water (from each source) shall be submitted along with each set of treated water samples.

ii) One of each of the treated water samples shall be taken at the water treatment plant after the required contact time. The remainder of the treated water samples shall be taken from representative points in the distribution system.

APPENDIX "C"

SUBMITTER – *FILL IN SHADED AREAS ONLY*
PLEASE PRINT CLEARLY USING HARD OR INDELIBLE PENCIL OR BALL POINT PEN

MICROBIOLOGICAL WATER REPORT

☒ WATER ☐ SWAB RINSE ☐ OTHER (Specify) _____
☐ ICE ☐ SEWAGE
☐ WELL ☐ RIVER OR LAKE

SUBMITTED BY: J. DOE

DATE SAMPLE COLLECTED OCTOBER 20/86

DATE SAMPLE SUBMITTED OCTOBER 20/86

DATE ANALYSIS COMMENCED

DATE ANALYSIS COMPLETED

LAB. NO.	SAMPLE NO.	LOCATION OF SAMPLE POINT	TOTAL COLIFORM PER 100 ML	FECAL COLIFORM	S.P.C. PER 1 ML		
	A	An-1-MP					
	B	An-2-MPC					
	C	An-3-MPC					
	D	An-4-MPC					

REPORT TO - (PRINT NAME, ADDRESS & POSTAL CODE)

J. DOE
BOX 123
ANYWHERE MANITOBA R0A0A0

Manitoba Health Services Commission

Cadham Provincial Laboratory
750 William Avenue.
P.O. Box 8450
Winnipeg, Manitoba
R3C 3Y1
Telephone (204) 944-0270

MHSC 2 MG 6685 (REV. 84)